

Thesis title: A Review on Bonus Malus Systems and the Introduction to Dynamic Bonus Malus System by the Use of Hidden Markov Models

Supervisor: Dr. Amir Teimour Payandeh

Advisor: Dr. Ghadir Mahdavi

By: Atefeh Kanani Dizaji

Abstract: In the most of commercial Bonus-Malus Systems (abbreviated BMS), knowledge of the current level and the number of claims, during the current period, suffice to determine the next level of policyholder which is closely related to the memory less property of Markov chains. Several authors introduced optimal, in some sense, Bonus-Malus System. But almost all of them consider the BMS to be markovian in which movements between classes are based on transition rules. Such transition rule works based upon the number of claims has been reported by a policyholder in current period. Obviously, it is not reasonable to determine the level of a policyholder for the next year, only, based upon his/her claim number. To introduce a dynamic BMS, we employ the sophisticated hidden Markov mode, introduced by Elliott et al (1995), in which the situation of policyholders according to their risk classes is not completely visible. And in order to classify the policyholders risk group we employ ordinal logistic regression to model the observation process by using extra information like the number of partial loss which is not reported, the number of claim free years before last claim and the personal information like age, gender, marital status, kind of car, usage of car etc. Using ordinal logistic regression the effectiveness of personal information as independent variables on the observed situation of policy holder is determined. The EM algorithm is give new probability measures used to estimate the parameters of model. The revised parameters for the model. The DBMS views the next year level of a given policyholder as a HMM, determined by using the ordinal logistic regression model, developed from exactly collected observations.